Roll No LHR-G2-12-18 (To be filled in by the candidate)

(Academic Sessions 2014 – 2016 to 2016 – 2018)

MATHEMATICS 218-(INTER PART – II) Time Allowed : 30 Minutes

Q.PAPER – II (Objective Type) GROUP – II Maximum Marks : 20

PAPER CODE = 8198

Note : Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink in the answer-book. Cutting or filling two or more circles will result in zero mark in that question.

1-1	$\frac{d}{dx}\ell og_a x =$: (A) $\frac{1}{x}$ (B) $x\ell nx - x$ (C) $\frac{1}{x}\ell na$ (D) $\frac{1}{x\,\ell na}$
2	$\int \sin x \cos x dx$: (A) $\frac{1}{2}\cos 2x$ (B) $-\frac{1}{2}\cos 2x$ (C) $\frac{\sin^2 x}{2}$ (D) $\frac{\cos^2 x}{2}$
3	$\int \frac{1}{x\sqrt{x^2-1}} dx$: (A) $\sin^{-1} x$ (B) $\tan^{-1} x$ (C) $\sec^{-1} x$ (D) $\cos ec^{-1} x$
4	If $x = f(\theta), y = g(\theta)$ then $\frac{dy}{dx}$: (A) $\frac{dy}{d\theta}\frac{d\theta}{dx}$ (B) $\frac{dx}{d\theta}\frac{d\theta}{dy}$ (C) $\frac{d\theta}{dy}\frac{dx}{d\theta}$ (D) $\frac{dy}{d\theta}\frac{dx}{d\theta}$
5	$\frac{d}{dx}\sec hx =$: (A) $\sec hx \tanh x$ (B) $-\sec hx \tanh x$ (C) $\tan h^2 x$ (D) $\sec h^2 x$
6	If at least one vertical line meets the curve at more than two points then curve is : (A) A function (B) Not a function (C) One – to – one function (D) Onto function
7	$\frac{d}{dx}\cosh x =$: (A) $-\sin hx$ (B) $\sec hx$ (C) $-\sec hx$ (D) $\sin hx$
8	$\int \sec^2 x dx$: (A) $\tan x$ (B) $\frac{\sec^3 x}{3}$ (C) $\tan^2 x$ (D) $\sec x \tan x$
9	Solution of $\frac{dy}{dx} = \frac{-y}{x}$ is : (A) $\frac{x}{y} = c$ (B) $\frac{y}{x} = c$ (C) $y = cx$ (D) $xy = c$

1-10	Domain of $f(x) = x^2 + 1$: (A) R (B) $R - \{1\}$ (C) $R - \{-1\}$ (D) $[1, \infty)$
11	Equation of line bisecting II and IV quadrant : (A) $y = x$ (B) $y = -x$ (C) $y = \frac{1}{x}$ (D) $x + y = 1$
12	Set of all points equidistant from a fixed point form : (A) Ellipse (B) Parabola (C) Hyperbola (D) Circle
13	Joint equation of two lines is $ax^2 + 2hxy + by^2 = 0$, if θ is angle between them, then $\tan\theta =$: (A) $\frac{2\sqrt{h^2+ab}}{a+b}$ (B) $\frac{2\sqrt{h^2-ab}}{a+b}$ (C) $\frac{\sqrt{h^2+ab}}{a+b}$ (D) $\frac{\sqrt{h^2-ab}}{a+b}$
14	Focal chord perpendicular to axis of parabola is called : (A) Latus Rectum (B) Eccentricity (C) Vertex (D) Axis
15	Horizontal line through $(7, -9)$ is : (A) $x = 7$ (B) $x = -9$ (C) $y = 7$ (D) $y = -9$
16	Projection of vector $\vec{u}$ on vector $\vec{v}$ is : (A) $\frac{\vec{u}\cdot\vec{v}}{\lvert v\rvert}$ (B) $\frac{\vec{u}\cdot\vec{v}}{\lvert u\rvert}$ (C) $\frac{\vec{u}\times\vec{v}}{\lvert v\rvert}$ (D) $\frac{\vec{u}\times\vec{v}}{\lvert u\rvert}$
17	Distance of (x_1, y_1) from line $ax + by + c = 0$ is : (A) $\frac{\lvert ax_1+by_1+c\rvert}{\sqrt{a^2+b^2}}$ (B) $\frac{\lvert ax_1+by_1-c\rvert}{\sqrt{a^2+b^2}}$ (C) $\frac{\lvert ax_1+by_1+c\rvert}{\sqrt{a+b}}$ (D) $\frac{\lvert ax_1+by_1-c\rvert}{\sqrt{a+b}}$
18	For ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, $(a>b)$ then eccentricity $e =$: (A) $\frac{\sqrt{a^2-b^2}}{a}$ (B) $\frac{\sqrt{a^2+b^2}}{a}$ (C) $\frac{\sqrt{b^2-a^2}}{a}$ (D) $\frac{\sqrt{b^2-a^2}}{b}$
19	If $\vec{v}$ is any vector then vector of magnitude 5 opposite to $\vec{v}$ is : (A) $5\vec{v}$ (B) $-5\vec{v}$ (C) $5\frac{\vec{v}}{\lvert v\rvert}$ (D) $-5\frac{\vec{v}}{\lvert v\rvert}$
20	System of linear inequalities involved in the problem is called : (A) Coefficients (B) Solution (C) Problem constraints (D) Boundaries

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MATHEMATICS 218-(INTER PART – II) Time Allowed : 2.30 hours

PAPER – II (Essay Type) GROUP – II Maximum Marks : 80

SECTION – I

LHR-G2-12-18

2. Write short answers to any EIGHT (8) questions : 16

(i) Prove that $\cosh^2 x + \sinh^2 x = \cosh 2x$

(ii) Determine whether function $f(x) = \dfrac{x^3 - x}{x^2 + 1}$ is even or odd.

(iii) Evaluate $\underset{x \to 0}{Lim} \dfrac{\sec x - \cos x}{x}$

(iv) Find $\dfrac{dy}{dx}$ if $y = \dfrac{a + x}{a - x}$

(v) Find $\dfrac{dy}{dx}$ if $x^2 - 4xy - 5y = 0$

(vi) Differentiate $x^2 - \dfrac{1}{x^2}$ *w.r.t* x^4

(vii) Differentiate $\sin^{-1}\sqrt{1 - x^2}$ *w.r.t* x

(viii) Find $\dfrac{dy}{dx}$ if $y = \ell n\left(x + \sqrt{x^2 + 1}\right)$

(ix) Find $\dfrac{dy}{dx}$ if $y = e^{-2x}\sin 2x$

(x) Find $\dfrac{d^2y}{dx^2}$ if $y^3 + 3ax^2 + x^3 = 0$

(xi) Find y_2 if $y = \cos^3 x$

(xii) Find $\dfrac{dy}{dx}$ if $y = \ell n\left(\dfrac{x^2 - 1}{x^2 + 1}\right)^{\frac{1}{2}}$

3. Write short answers to any EIGHT (8) questions : 16

(i) Find δy and dy : $y = \sqrt{x}$, when x changes from 4 to 4.41

(ii) Evaluate $\int \dfrac{e^{2x} + e^x}{e^x} dx$

(iii) Evaluate $\int (a - 2x)^{3/2} dx$

(iv) Evaluate $\int \dfrac{x + b}{(x^2 + 2bx + c)^{\frac{1}{2}}} dx$

(v) Evaluate $\int xe^x dx$

(vi) Evaluate $\int e^x \left(\dfrac{1}{x} + \ell nx\right) dx$

(vii) Evaluate $\int_{-1}^{3} (x^3 + 3x^2) dx$

(viii) Evaluate $\int_{0}^{\pi/3} \cos^2\theta \sin\theta \, d\theta$

3. (ix) Find the area between the x-axis and the curve $y = 4x - x^2$ from $x = 0$ to $x = 4$

(x) Define differential equation.

(xi) Solve $\frac{dy}{dx} = \frac{y^2 + 1}{e^{-x}}$

(xii) Solve $\frac{dy}{dx} = 2x$

4. Write short answers to any NINE (9) questions : **18**

(i) Write down equation of straight line with x-intercept (2 , 0) and y-intercept (0 , – 4)

(ii) Find an equation of a line bisecting 2nd and 4th quadrants.

(iii) Find an equation of a line with x-intercept : – 9 and slope : – 4 .

(iv) Prove that if the lines are perpendicular, then product of their slopes = – 1

(v) Find the measure of angle between the lines represented by $x^2 - xy - 6y^2 = 0$

(vi) Find focus and vertex of the parabola $y = 6x^2 - 1$

(vii) Find equation of latus rectum of parabola $y^2 = -8(x - 3)$

(viii) Find an equation of an ellipse with foci (± 3 , 0) and minor axis of length 10.

(ix) Find the foci and length of the latus rectum of the ellipse $9x^2 + y^2 = 18$

(x) Define direction angles and direction cosines of a vector.

(xi) Find the projection of vector $\underline{a}$ along vector $\underline{b}$ and projection of vector $\underline{b}$ along $\underline{a}$ when $\underline{a} = \hat{i} - \hat{k}$, $\underline{b} = \hat{j} + \hat{k}$

(xii) Find a vector perpendicular to each of the vectors $\underline{a} = 2\hat{i} + \hat{j} + \hat{k}$ and $\underline{b} = 4\hat{i} + 2\hat{j} - \hat{k}$

(xiii) Convert $2x - 4y + 11 = 0$ into slope intercept form.

SECTION – II

Note : Attempt any THREE questions.

5. (a) Prove that $\lim_{x \to 0} \frac{a^x - 1}{x} = \log_e a$ 5

(b) Prove that $y\frac{dy}{dx} + x = 0$ if $x = \frac{1 - t^2}{1 + t^2}$, $y = \frac{2t}{1 + t^2}$ 5

6. (a) Show that $\int \frac{dx}{\sqrt{x^2 - a^2}} = \ell n(x + \sqrt{x^2 - a^2}) + c$ 5

(b) The points A (– 1 , 2) , B (6 , 3) and C (2 , – 4) are vertices of a triangle, then show that the line joining the mid-point " D " of $\overline{AB}$ and mid-point " E " of $\overline{AC}$ is parallel to $\overline{BC}$ and $\overline{DE} = \frac{1}{2}\overline{BC}$. 5

7. (a) Evaluate $\int_0^{\frac{\pi}{4}} \cos^4 t \, dt$ 5

(b) Graph the feasible region of system of linear inequalities and find the corner points
$2x + 3y \leq 18, x + 4y \leq 12$, $3x + y \leq 12$ $x \geq 0, y \geq 0$ 5

8. (a) Find an equation of parabola having its focus at the origin and directrix parallel to y-axis. 5

(b) Prove that the line segment joining the mid-points of two sides of a triangle is parallel to the third side and half as long. 5

9. (a) Find the centre, foci, eccentricity, vertices and equations of directices of $\frac{y^2}{4} - x^2 = 1$ 5

(b) Find the value of α, in the coplanar vectors $\alpha\hat{i} + \hat{j}$, $\hat{i} + \hat{j} + 3\hat{k}$, $2\hat{i} + \hat{j} - 2\hat{k}$ 5